

## REMARKS

Reconsideration of the application is respectfully requested.

Claims 1-2 and 4-19 are pending in the subject application. These claims are rejected under 35 U.S.C. § 103(a) as being unpatentable over US Patent 5,972,424 to Draghi et al. in view of US Patent 6,049,978 to Arnold, US Patent 6,074,706 to Beverly et al. and US Patent 3,570,449 to Blecherman et al.

The above rejection is respectfully disagreed with, and is traversed below.

Applicants initially would like to thank Examiner Bareford for the courtesies extended to Applicants' representative during the telephone discussion of December 7, 2005. This reply is submitted in accordance with this discussion.

It is respectfully asserted that the Examiner's proposed combination of the cited references fails to teach or suggest all of the limitations recited in each of independent claims 1, 13 and 19. At the very least, this proposed combination fails to teach or suggest Applicants' process including the claimed steps of:

c) reapplying the bond coat to the substrate at a thickness which is about the same as the thickness applied prior to the engine operation; wherein after application of the bond coat the component is weighed, denoted by  $w_4$ , to determine a weight margin remaining, wherein a combination of at least two of  $w_0$ ,  $w_1$ ,  $w_2$ ,  $w_3$  and  $w_4$  is employed to determine the amount of removed base metal and calculate a thickness in which to apply a top ceramic thermal barrier coating without incurring a weight penalty;

d) reapplying a top ceramic thermal barrier coating to a nominal thickness of  $t+\Delta t$ , wherein  $\Delta t$  compensates for the portion of base metal substrate removed in b) to restore adjacent airfoil to airfoil throat distance to about the distance preceding the engine run so that the dimensions of the coated component are restored to about the coated dimensions preceding the engine run to increase subsequent engine operation efficiency, wherein the thermal barrier coating of d) is applied at a thickness greater than the thermal barrier coating a); and weight of the component having the bond coat of c) and the thermal barrier coating of d) thereon is denoted by  $w_5$ , wherein  $w_5$  is less than  $w_1$ ."

The Draghi et al., Arnold and Beverly et al. references have been described in detail in Applicants' prior responses and the Examiner is respectfully directed to these descriptions. Regarding the newly cited Blecherman et al. reference, it is asserted that this reference does not cure the shortcomings of Draghi et al., Arnold and Beverly et al. In particular, Blecherman et al. is a 1971 reference disclosing an apparatus for continuously determining the coating thickness deposited on an article during a vapor deposition process. Blecherman et al. do not perform any weight measurements to determine any amount of base metal removed and calculate any thickness in which to apply any top thermal barrier coating without incurring a weight penalty. The apparatus of Blecherman et al. merely continuously records vapor coating deposited to ensure a uniform thickness of coating on the article. The problem addressed by Blecherman et al. relates to depositing coatings of constant and reproducible chemistry of uniform thickness by maintaining equilibrium between a solid ingot, molten pool and vapors that leave the pool. Applicants respectfully assert that this in no way discloses or suggests all of the features of the claimed process, whether the Blecherman et al. reference is viewed alone or in any combination with the other cited references.

Moreover, the unexpected benefits of the claimed invention beyond mere routine experimentation cannot be ignored and are not disclosed in, nor suggested by, the cited references. Applicants have developed a process in which a newly applied TBC is tailored to restore the airfoil section contours without incurring a weight penalty. The TBC is not applied to any random thickness which would automatically be lighter than the originally coated component. Applicants have unexpectedly determined how to restore the airfoil dimensions without incurring a weight penalty. There is no disclosure or suggestion in the cited references of a process as claimed herein including the claimed weight calculations wherein  $w_5 < w_1$ . There is no suggestion of providing any restoration as claimed herein without a weight penalty. There is no suggestion of any method to restore adjacent airfoil to airfoil throat distances such that the weight after restoration is less than the weight before engine operation. Nor is there a suggestion of the way in which the bond and TBC coatings are applied in order to restore the coated dimensions to about the dimensions preceding the engine run without a weight penalty.

The Examiner asserts at page 8 of the outstanding Action that Beverly et al. suggest the claimed invention in that this reference suggests the application of a ceramic coating to a thickness of  $t+\Delta t$  so as to provide a component of original dimensions, thus restoring adjacent airfoil to airfoil throat distance to the original dimensions, and to provide the new thermal barrier coating of a greater thickness than the original thermal barrier coating ... Beverly teaches that it is desired for bond coats to be applied in a narrow range of thicknesses and the top ceramic coat, on the other hand, can be provided at a variety of thicknesses. Applicants respectfully disagree.

First, Applicants respectfully point out that Beverly et al. disclose at col. 5, lines 1-5 that the thickness of the bond coat is preferably not more than 0.005 inches in order to ensure that the groove 32 will be present in its surface. Thus, Beverly et al. teach that this bond coat should be in “a narrow range of thickness,” as referred to by the Examiner, to provide the support for the grooves.

Additionally, Beverly et al. merely generally teach at col. 4 that the ceramic layer 26 is deposited to a thickness that is sufficient to provide the required thermal protection for the underlying substrate. The thickness of ceramic layer 26 varies at the grooved locations as shown in Fig. 2 of Beverly et al. This does not provide any motivation for the skilled artisan to arrive at Applicants’ particularly claimed process including the claimed weight calculations and thickness application determinations to provide a coated component that has restored airfoil to airfoil throat distances without a weight penalty.

Applicants have determined how to compensate for base metal loss as a result of coating removal processes, and also restore airfoil section contour to its pre-repair or original coated airfoil contour dimensions, without a weight penalty. For instance, Applicants’ weight/thickness margin remaining may be used to determine the thickness in which to apply a TBC in order to restore the airfoil dimensions without suffering a weight penalty.

Advantageously, the newly coated component has the restored dimensions to meet the original aerodynamic intent of the part, as shown in Fig. 3 and does not suffer a weight penalty. Thus, an important advantage of embodiments of the invention is that resulting airfoil throat area restoration will allow the turbine to run much more efficiently.

Applicants respectfully assert that there is no teaching, suggestion or motivation that would lead one of ordinary skill in the art to combine and then modify the teachings of the cited references in an attempt to arrive at the present claims. Without such a teaching or suggestion, the invention may only be considered obvious in hindsight, which is an improper basis for rejection.

For at least the reasons set forth above, independent claims 1, 13 and 19 should be found to be allowable. In that these independent claims are in condition for allowance, then the remaining dependent claims should also be found to be allowable in view of their dependence from an allowable independent claim.

All issues raised by the Examiner having been addressed, the subject patent application is believed to be in condition for immediate allowance. Accordingly, a Notice of Allowance is respectfully requested.

According to currently recommended Patent Office policy, the Examiner is requested to contact the undersigned at the telephone number provided below in the event that a telephone discussion will advance the prosecution of this application. An early and favorable action is earnestly solicited.

No fees are believed due with this amendment. However, should the undersigned attorney be mistaken regarding whether any fees are due, then please adjust deposit account no.: 50-1924, accordingly.

Respectfully submitted,

Christine Wilkes Beninati

1/3/06

Christine Wilkes Beninati  
Reg. No. 37,967  
Harrington & Smith, LLP  
4 Research Drive  
Shelton, CT 06484-6212  
Tel.: (203) 925-9400, ext.: 17



## CERTIFICATE OF MAILING

I hereby certify that the correspondence is being deposited with the United States Postal Service as first class mail on the date shown below in an envelope addressed to:  
Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313

1/3/2006  
Date

Clair F. Mian  
Signature of Person Making Deposit